QuEST

National Aeronautics and Space Administration

Qualifying Environmentally Sustainable Technologies

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Welcome Message

While taking this opportunity to reflect on this year's accomplishments within the TEERM Office, it's important to note when the program was established and why it was eventually renamed. TEERM, originally known as the Acquisition Pollution Prevention (AP2) Program, was established in 1998 to reduce or eliminate hazardous materials that are used during the design, production and operations of NASA programs.

In 2007, AP2 was changed to Technology Evaluation for Environmental Risk Mitigation (TEERM) to emphasize the shift from NASA's effect on the environment to what are the environmentally driven risks to the programs. Throughout these transitional times, what has remained consistent is the company that provides engineering and project management support for TEERM. International Trade Bridge, Inc. (ITB) has managed to adapt their business model to remain aligned with the agency's environmental management needs. The key to TEERM's success is the ability to seek out stakeholders who share the same challenges and determine joint activities for meeting a common set of requirements without duplicating effort. Based on testing capabilities and proven mitigation planning, TEERM will continue to identify synergistic opportunities such as the follow-on collaborative effort with the European Space Agency that will benefit from work that was previously supported by KSC's Ground Systems Development & Operations Program.

With the agency's recent technology capabilities assessment, which included a thorough review of the NASA's ground assets with recommended improvements that are required to meet current and future mission requirements, TEERM is addressing this initiative by proposing environmental sustainability projects that would leverage our ongoing activities with our industry and international partners that we intend to feature in our next Qualifying Environmentally Sustainable Technologies (QuEST) newsletter… stay tuned.

Thank you for your continued interest and support!

Joni Richards
TEERM Principal Center Manager
NASA KSC/UB-T

Protecting NASA's Infrastructure

The NASA TEERM program is a leading force in the Agency for evaluating technologies to limit environmentally driven risks to NASA's mission. Increasingly, TEERM also looks for technologies that both benefit the environment and enhance the resilience of NASA's infrastructure. NASA is working in close collaboration with other Federal and State authorities to assess the risk it faces in terms of threats, vulnerabilities, and consequences.

Recently, the NASA TEERM office has begun exploring collaborative projects with European partners who maintain important mission operations for NASA. One such effort being developed is a joint evaluation of technologies for renewable energy generation and storage to enhance the resiliency of NASA assets at remote locations, such as the Svalbard Satellite Tracking Facility (SvalSat) in Norway. SvalSat has over 61 tracking antennae, and is the only commercial ground station able to provide all orbit support to polar orbiting satellites.

Operations at this remote station support NASA missions that require earth observation by satellites. Projects like these offer potential benefits of reducing greenhouse gas emissions while enhancing resilience of facilities critical to NASA's mission.

Svalbard Satellite Station (SvalSat), operated by Kongsberg Satellite Services (KSAT) and situated north of the Arctic Circle, supports space communication for various agencies such as NASA, National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey (USGS), and European Space Agency (ESA).

TEERM Year In Review

NASA TEERM is managing several projects to validate environmentally preferable coatings for NASA applications. In these projects we are testing coatings that contain no heavy metals, ozone depleting substances, and/or hazardous air pollutants and comparing their performance against current materials. TEERM is also evaluating an alternative passivation method for stainless steel. These alternatives, if implemented, will reduce the risk of chemicals being regulated out of use.

In one coating project, TEERM is working with the U.S. Naval Air Systems Command (NAVAIR) and other DoD partners on a comprehensive evaluation and transition of non-chromated paint primers. TEERM is managing the NASA portion of this collaborative study. Chrome-free primers are in-test at the Kennedy Space Center beach front exposure site, and access panels are installed on a NASA P-3 aircraft. TEERM is working with NAVAIR to get hexavalent chrome free primers applied to a NASA C-130 aircraft as well as test and evaluate hexavalent chrome free coatings currently being developed by NAVAIR. This project builds off of previously successful NASA and U.S. Department of Defense (DoD) testing.

One effective approach to mitigating materials obsolescence risks is through international collaboration with agencies such as the European Space Agency (ESA). Both agencies process flight hardware and maintain ground based facilities and therefore face many of the same challenges, including increasingly stringent environmental regulations that pose cost, schedule and technical risk to their missions. Collaboration offers the advantage of leveraging resources and the sharing of knowledge and technical expertise to aid in identifying and evaluating potential solutions. TEERM facilitated a NASA-ESA agreement that allows both agencies to work together in evaluating alternatives to hexavalent chromium-containing coatings for aerospace applications.

TEERM is working with ESA on developing joint NASA-ESA plans for other projects, as well. Data generated from three ongoing NASA Ground Systems Development and Operations (GSDO) projects will be used in the development of the test plans. These include a hexavalent chromium free coatings project that is approaching the next phase of testing and new coordinated efforts on environmentally-preferable coatings and citric acid passivation.

Another example of TEERM international collaboration is co-hosting workshops with European partners. In November 2014, NASA hosted the 12th International Environmental and Energy Workshop at NASA Kennedy Space Center. The event achieved its greatest attendance to date with 150 individuals from 15 nations attending. Thirty-eight U.S. and international subject matter experts presented collaborative activities and sustainability measures that will increase resiliency of essential capabilities required to support future missions. NASA and European partners will hold the next international workshop on November 10-13, 2015 at the ESA European Space Astronomy Center in Spain. Please visit the TEERM website *(*http://www.teerm.nasa.gov/*)* for more information on these workshops.

In the area of groundwater and soil cleanup, TEERM facilitated three field demonstrations at NASA Stennis Space Center; a novel in-situ bioremediation technology, a high resolution site characterization, and a horizontal directionally drilled multiport sampling and injection well. TEERM also supported the preparation and submittal of performance-based remediation contracts for SSC designed to significantly reduce the time to site closure.

TEERM has also been active in the study of wind, solar, and hydrogen fuel cell-produced energy at NASA. Many of these technologies present opportunities to not only reduce energy consumption and greenhouse gas emissions but also enhance resilience of NASA facilities to climate change impacts and other external threats. To that end, TEERM is looking to identify promising technologies toward green infrastructure, power system resilience, and water and energy conservation.

2014 Workshop student session participants pictured with Holger Fischer (Far Left) and James Leatherwood, (Far Right) of NASA's Environmental Management Division.

TEERM Support

Technical, engineering, business, and management support for TEERM is provided by staff from ITB, Inc., headquartered in Dayton, Ohio. ITB has been part of TEERM since the program's inception in 1998. ITB engineers identify opportunities for collaboration and develop them into joint projects, which ITB then manages or otherwise supports. ITB provides support to NASA Headquarters on environmental, remediation, energy, and water matters.

QuEST is a publication of the NASA Technology Evaluation for Environmental Risk Mitigation Principal Center (TEERM) located at Kennedy Space Center, FL.

For more information, please visit our website at http://teerm.nasa.gov

If you have questions, please send us an email at teermnewsletter@itb-inc.com